ES10.

DESIGN OF AN AERATION SYSTEM FOR THE INCLINED STEP GRATE COMPOST MAKING VESSEL: OPTIMIZING THE CHIMNEY EFFECT

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Like in other countries, Sri Lanka also faces immense problems in managing urban solid wastes. Landfill and incineration have until now been the most widely used means of solid waste disposal methods but in recent years interest has grown in disposal methods which take recycling into consideration. One of the most successful systems used in many countries is the transformation of biodegradable organic material from various sources into humic substances known as compost.

By considering the agricultural demand for compost and facilities available, composting is selected as the best way by means of solid waste management for Sri Lanka. In order to design a commercial system to make compost continuously and rapidly, an engineering model was developed. The results of the engineering model are promising and in this study the steps were taken to scale-up the model for designing a large compost making vessel with a capacity of 2.5 tonnes per day throughput for 100% organic matter and 4 tonnes per day for mixed wastes.

The physical and mathematical expressions obtained from the engineering model were used to design the vessel. The relationship between velocity through the waste and pressure loss was obtained experimentally. The pressure losses of the waste pile at low velocities are negligible. The study indicates that at least three 8m height and 0.388 m diameter chimneys should be fixed to the large unit in order to supply the required airflow rate of 0.0862 m^3/s. The heat transfer coefficient and effective area index were determined and they are 15 W/m^2 K and 0.3 respectively. Furthermore, heat and mass balances were done to ensure that the system would work effectively.

It is recommended that the proposed step grate compost-making vessel should incorporate a system for heating up and cooling the waste pile. This additional system could be used when required.